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$\mathrm{div}\, E = \frac{\rho}{\epsilon_0}$	$\oint_S E.dS = \frac{Q}{\epsilon_0}$
$\mathrm{div}\, B = 0$	$\oint_S B.dS = \int_V \mathrm{div}\, B\, dv = 0$
$\mathrm{rot}\, E = -\frac{\partial B}{\partial t}$	$\oint_C E.dl = -\int_S \frac{\partial B}{\partial t}.dS = -\frac{d\Phi_B}{dt}$
$\mathrm{rot}\, B = \mu_0 \vec{J} + \epsilon_0\mu_0 \frac{\partial E}{\partial t}$	$\oint_C \vec{B}dl = \mu_0 i + \epsilon_0\mu_0 \oint_S \frac{\partial E}{\partial t} dS = \mu_0 i + \epsilon_0\mu_0 \frac{d\Phi_e}{dt}$

$$B = \frac{\mu_0 i}{4\pi} \frac{\oint dl \times \hat{r}}{r^2}$$

$$V = \frac{1}{4\pi\epsilon_0} \frac{Q}{r} = k\frac{Q}{r}$$

$$E = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2}\hat{r} = -grad\, V$$

$$V(r) = -\int_\infty^r E.dl = \frac{q}{4\pi\epsilon_0 r}$$

$$\vec{F} = q(\vec{E} + \vec{v} \times \vec{B}) \qquad \vec{F} = i \oint_C dl \times \vec{B}$$

$$C = \frac{Q}{V} = \frac{\epsilon_0 A}{d}$$

$$\frac{\partial^2 B_y}{\partial z^2} - \mu_0\epsilon_0 \frac{\partial^2 B_y}{\partial t^2} = 0$$

$$\frac{\partial^2 E_x}{\partial z^2} - \mu_0\epsilon_0 \frac{\partial^2 E_x}{\partial t^2} = 0$$

$$B = \frac{A}{c}\cos(kz - wt)\hat{y}$$

$$T = \frac{2\pi}{w} \qquad f = \frac{1}{T} \qquad \lambda = \frac{2\pi}{k}$$

$$\frac{E}{B} = c \qquad S = \frac{1}{\mu_0} E \times B$$

$$u_E = \frac{1}{2}\epsilon_0 E^2 \qquad = \qquad u_B = \frac{B^2}{2\mu_0}$$

$$I = S_{med} = \frac{E_{max} B_{max}}{2\mu_0} = c.u_{med}$$

$$P = (1 + f_{ref})\frac{I}{c} \qquad I = I_0 \cos^2\theta$$

$$E = hf \qquad \lambda = \frac{h}{p} \qquad \lambda_n = \frac{2l}{n} \qquad p_n = \pm\frac{h}{\lambda_n} = \pm n\frac{h}{2l}$$

$$E_n = \frac{1}{2m}p_n^2 = n^2 \frac{h^2}{2ml^2}$$

$$p_f = h\left(\frac{3n}{8\pi}\right)^{\frac{1}{3}} \qquad v_f = \frac{p_f}{m_e}$$

$$k = \frac{1}{4\pi\epsilon_0} = 10^{-7}c^2 = 8,98755 \times 10^9 \qquad N \times \frac{m^2}{C^2}$$

$$e = 1,60217733 \times 10^{-19} \qquad C$$

$$\epsilon_0 = 8,854187817 \times 10^{-12}\frac{F}{m}$$

$$\mu_0 = 4\pi \times 10^{-7} \qquad \frac{N}{A^2}$$

$$c = 2,99792458 \times 10^8 \qquad \frac{m}{s}$$

$$m_e = \frac{e^2}{4\pi\epsilon_0 r_0 c^2} = 9,1093897 \times 10^{-31} \qquad kg$$

$$h = 6,626075 \times 10^{-34} \qquad J.s$$

$$\lambda_c = \frac{h}{m_e c} = 2,42631058 \qquad pm$$

$$1u = 931,49432 \qquad \frac{MeV}{c^2}$$

$$P_0 = 1atm = 1,013 \times 10^5 Pa$$

$$R = 8,315\frac{J}{mol}K = 0,0821L\frac{atm}{mol}K$$

$$k_B = \frac{R}{N_A} = 1,38 \times 10^{-23} J/K$$

$$N_A = 6,02 \times 10^{-23} \qquad \frac{moleculas}{mol}$$

$$1cal = 4,186J$$

$$\frac{\sin\theta_2}{\sin\theta_1} = \frac{v_2}{v_1}$$

$$n = \frac{c}{v}$$

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$M = \frac{h'}{h} = -\frac{q}{p}$$

$$\frac{1}{p} + \frac{1}{q} = \frac{1}{p}$$

$$\delta = d\sin\theta$$

$$\delta = d\sin\theta_{bril} = m\lambda$$

$$\delta = d\sin\theta_{esc} = (m + \frac{1}{2})\lambda$$

$$2d\sin\theta_{cris} = m\lambda$$

$$\mathscr{P} = \sigma A e T^{-4}$$

$$\lambda_{max} T = 2,898 \times 10^{-3} m.K$$

$$K_{max} = hf - \phi$$

$$\lambda_c = \frac{c}{f_c} = \frac{c}{\phi/h} = \frac{hc}{\phi}$$

$$\lambda' - \lambda_0 = \frac{h}{m_e c}(1 - \cos\theta)$$

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

$$\Delta x \Delta p_x \leq \frac{\hbar}{2} \qquad \Delta E \Delta t \leq \frac{\hbar}{2}$$

$$\frac{dN}{dt} = -\lambda N \qquad N = N_0 e^{-\lambda t}$$

$$R = \left|\frac{dN}{dt}\right| = N_0 \lambda e^{-\lambda t} = R_0 e^{-\lambda t}$$

$$T_{\frac{1}{2}} = \frac{ln2}{\lambda} = \frac{0,693}{\lambda}$$

$$Q = (M_X - M_Y - M_\alpha)c^2 = (M_X - M_Y - M_\alpha) \times 931,494 MeV/u$$

$$\int_{-\infty}^{\infty} |\Psi|^2 dx = \int_{-\infty}^{\infty} |\Psi|^2 4\pi r^2 dr = 1$$

$$E_n = (\frac{h^2}{8mL^2})n^2$$

$$E_H = -(\frac{k_e e^2}{2a_0})\frac{1}{n^2} = -\frac{13,606eV}{n^2}$$

$$E_{Z_{ef}} = -\frac{(13,606eV)Z_{ef}^2}{n^2}$$

$$\sin 2\theta = 2\sin\theta\cos\theta$$

$$\cos 2\theta = \cos^2\theta - \sin^2\theta = 1 - 2\sin^2\theta = 2\cos^2\theta - 1$$

$$\sin(a \pm b) = \sin a \cos b \pm \cos a \sin b$$

$$F = -kx \qquad \frac{d^2x}{dt^2} = -\frac{k}{m}x$$

$$w = \sqrt{\frac{k}{m}} \qquad E = \frac{kx^2}{2}$$

$$-mg\sin\theta = m\frac{d^2s}{dt^2} \qquad \frac{d^2\theta}{dt^2} = -\frac{g}{L}\theta$$

$$v = \sqrt{\frac{T}{\mu}}$$

$$f' = f\Big(\frac{v + v_O}{v - v_S}\Big)$$

$$\mathscr{P} = \frac{1}{2}\mu\omega^2 A^2 v$$

$$f_n = \frac{v}{\lambda_n} = \frac{n}{2L}v = \frac{n}{2L}\sqrt{\frac{T}{\mu}}$$

$$P = P_0 + \rho g h$$

$$P_1 + \frac{1}{2}\rho v_1^2 + \rho g y_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g y_2$$

$$T_C = T - 273,15$$

$$T_F = \frac{9}{5}T_C + 32^\circ F$$

$$\Delta L = \alpha L_i \Delta T$$

$$PV = nRT$$

$$P = \frac{2}{3}(\frac{N}{V})(\frac{1}{2}m\overline{v^2})$$

$$\frac{1}{2}m\overline{v^2} = \frac{3}{2}k_B T$$

$$Q = mc\Delta T$$

$$W = -\int_{V_i}^{V_f} P dV$$

$$\Delta E_{int} = Q + W$$

$$E_{int} = \frac{3}{2}nRT$$

$$\gamma = \frac{C_P}{C_V} = \frac{\frac{5}{2}R}{\frac{3}{2}R} = \frac{5}{3}$$

$$PV^\gamma = constante$$

$$\mathscr{P} = \sigma A e T^{-4}$$

$$e = \frac{W_{maq}}{|Q_q|} = 1 - \frac{|Q_f|}{|Q_q|}$$

$$e_{carnot} = 1 - \frac{T_f}{T_q}$$

$$dS = \frac{dQ_r}{T}$$

$$S = k_B \, ln W$$

$$\Delta S = \int_i^f \frac{dQ_r}{T}$$

$$L_{arclength} = \int \sqrt{1 + \Big(\frac{dy}{dx}\Big)^2} dy$$

$$S_{surface} = \int\int_D \sqrt{(f_x)^2 + (f_y)^2 + 1} dA$$

$$\oint_C F.dr = \int\int_S \nabla \times F.\hat{n} dS$$

$$\int_V \operatorname{div} F dV = \int_S F.dS$$

$$Ax = B \rightarrow A^T A x = A^T B \rightarrow x = (A^T A)^{-1} A^T B$$